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Hergiet-General CORPORATION

AZUSA, CALIFORNIA

INFORMAL REPORT OF PROGRESS

Copy No.

21 September 1961

TO:

Commanding General

Frankford Arsencl

Philadelphia 37, Pennsylvania

Attn: ORDBA, Dr. H. Gisser

in this

SUBJECT:

Investigation of Stress-Corrosion Cracking

of High-Strength Alloys

CONTRACT.

DA-01-105-02D-3060

PERIOD

COVERED:

1 August through 31 August 1961

This is the tinth in a series of informal progress reports submitted in partial fulfillment of the contract.

AEROJET-CENERAL CORPORATION

news 63

Head, Metallics & Refractories Cection Research and Engineering Dept. Structural Materials Division

NOTE: The intormation contained herein is regarded as proliminary and subject to further checking, verification, and analysis.

I. GBJECTIVES

The objectives of this program are:

- A. To study the susceptibility to stress-corrosion cracking of rocket-motor case materials: e.a., Vascojet 1000, Type 300M, and Ladish DEAC steels, AM355 and PH 15-7 Mo stainless steels, and B120VCA titanium
- B. To study the environmental parameters, including the atmosphere outside and inside the rucket case, that affect the rate and extens of stress corrosion
- C. To determine the effect of material parameters composition, strength level, welding, micro-structure, surface conditions, etc. on the stress-corresion process
- D. To devise and evaluate techniques for preventing the stress-corrosion cracking of rocket-motor case materials.

II. WORK PROGRESS

A. BENT-BEAM STECIMENS

A summary of all the environmental bent-beam stress-corrosion test data compiled to date is given in Table 1. These results reflect both completed rests and tests that are currently in progress. Six alloys are being evaluated in ten different environments. Specimens of Ladish DOAT, Type 300M, and Vasco-jet 1000 alloy steels, AM355 and PH 15-7 Mo stainless steels, and BL20VCA titanium alloy were tested in air, distilled water, tap water, 0.255 redium dichromate solution, 1% marquench salt solution, 3% sodium chloride solution, trichloroethylene, cosmoline, 4% soluble cil solution, and high humidity.

Additional long-term testing of each alloy was initiated. Previous environmental stress-corrosion tests were terminated after 21 days, and the only alloy to fail after this period was the Vascojet 1000 steel. It is hoped that extended environmental stress-corrosion tests will indicate the relative susceptibility to stress-corrosion cracking of each alloy. Only the relatively severe environments of tap and distilled water were chosen, and the specimens were selected from the high-strength groups of each alloy. In addition, it is expected that the high-humidity tests will produce relatively rapid failures, so that the relative susceptibility to stress-corrosion cracking of each alloy may be more firmly established.

B. U-BEND SPECIFIENS

Table 2 summarizes all of the U-bend stress-corrorion test data compiled to date. Three alloys are currently undergoing testing in eight different environments. U-bend specimens of Ladish DOAC, Type 300M, and Vascojet alloy steels are being tested in distilled water, tap water, 0.25% sodium dichromate solution, 15 marquench salt solution, 3% sodium chloride solution, trichloroethylene, cosmoline, and 4% soluble oil solution.

The test results reflect the cumulative effects of 72 days of testing. Failures were observed with each alloy in the environments of distilled water, tap water, sait water, and trichloroethylene. It is significant to note that in each case the Vascojet 1000 alloy showed the greatest succeptibility to stress-corrosion failure, while the Ladish DOAC alloy was the most resistant to stress-corrosion cracking.

III. FUTUPE WORK

Data will continue to be accumulated on tests already in progress. Preparations are being made for fabricating welded test specimens with those alloys that appear to manifest the greatest resistance to stress-corrosion cracking. In addition, preparations for testing in the environments of high humidity and solid propellants are being made.

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Vascojet 2000

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